

We claim:

- 5 1. An isothermal process for the dehydrogenation of alkanes to the corresponding alkenes over a catalyst bed comprising a dehydrogenation-active catalyst, wherein the catalyst bed comprises a catalytically inactive, inert diluent material.
- 10 2. A process as claimed in claim 1, wherein the catalytically inactive, inert diluent material is selected from the group consisting of the oxides of elements of main groups II, III and IV, transition groups III and IV and V and mixtures thereof and nitrides and carbides of elements of main groups III and IV.
- 15 3. A process as claimed in claim 1 or 2, wherein the catalytically inactive, inert diluent material is selected from the group consisting of magnesium oxide, aluminum oxide, silicon dioxide, steatite, titanium dioxide, zirconium dioxide, niobium oxide, thorium oxide, aluminum nitride, silicon carbide, magnesium silicate, aluminum silicate, clay, kaolin, pumice and mixtures thereof.
- 20 4. A process as claimed in any of claims 1 to 3, wherein the catalytically inactive, inert diluent material has a BET surface area of $< 10 \text{ m}^2/\text{g}$.
- 25 5. A process as claimed in any of claims 1 to 4, wherein the catalytically inactive, inert diluent material has a coefficient of thermal conduction of $> 0.04 \text{ W}/(\text{m} \times \text{K})$.

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6. A process as claimed in any of claims 1 to 5, wherein the space-time yield based on alkene formed is limited to $7.0 \text{ kg}/(\text{kg}_{\text{bed}} \times \text{h})$ by the presence of the catalytically inactive diluent material in the catalyst bed.
- 5 7. A process as claimed in any of claims 1 to 6, wherein the catalytically inactive, inert diluent material is present in the form of shaped bodies selected from the group consisting of pellets and extrudates having an average diameter of from 2 to 8 mm, an average height of from 2 to 16 mm, with the height being from 0.5 to 4 times the diameter, rings and hollow extrudates having an average external
10 diameter and an average height of from 6 to 20 mm, with the height being from 0.5 to 4 times the diameter and the wall thickness being from 0.1 to 0.25 times the diameter, and spheres having an average diameter of from 1 to 5 mm.
8. A process as claimed in any of claims 1 to 7, wherein the proportion of empty
15 space in the bed is at least 30%.
9. A process as claimed in any of claims 1 to 8, wherein the dehydrogenation-active catalyst comprises one or more elements of transition group VIII, one or more elements of main groups I and/or II, one or more elements of transition group III
20 including the lanthanides and actinides and one or more elements of main groups III and/or IV on an oxidic support.
10. A process as claimed in any of claims 1 to 9 carried out in a tube reactor or a shell-and-tube reactor.
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11. A process as claimed in any of claims 1 to 10 in which propane is dehydrogenated.